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MEDICINAL SIGNIFICANCE AND ANTIFUNGAL POTENTIAL OF BLUMEA LACERA: AN ETHNOBOTANICAL APPROACH

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Abstract
Herbal medicines are widely used in both developed and developing countries for primary healthcare due to their diverse biological activities, high safety profile, and cost-effectiveness. Medicinal plants have traditionally been employed in the treatment of burns, dermatophytic infections, and various infectious diseases. The increasing emergence of resistant pathogens has intensified the search for novel antimicrobial agents from natural sources.
Blumea lacera (L.) DC., a member of the family Compositae (Asteraceae), is a common annual rabi weed in India characterized by its distinctive turpentine-like odor. The present study was undertaken to evaluate the antifungal potential of Blumea lacera against selected fungal pathogens. Plant extracts were prepared using different solvents, namely methanol, acetone, and water, at various concentrations. Antifungal activity was assessed against Aspergillus flavus, Aspergillus niger, Alternaria sp., Penicillium sp., and Fusarium sp. using the paper disc diffusion method.
The results revealed that most of the extracts exhibited significant antifungal activity against the tested fungi. The efficacy of the extracts was compared with the standard fungicide carbendazim. Several extracts demonstrated antifungal effects comparable to or greater than those of the reference fungicide, indicating the potential of Blumea lacera as a promising source of natural antifungal compounds.

Keywords: Blumea lacera, Ethnobotany, Antifungal activity, Medicinal plants, Aqueous extract, Phytochemicals, Fungal pathogens, Natural antifungal agents, Traditional medicine, Secondary metabolites.

INTRODUCTION
Medicinal plants have served as an important source of therapeutic agents throughout human history and continue to play a significant role in healthcare systems worldwide. Plant-derived compounds have contributed substantially to the discovery and development of modern pharmaceuticals owing to their diverse bioactive constituents and relatively low toxicity. In developing countries, a large proportion of the population still relies on traditional herbal medicines for primary healthcare needs. The increasing emergence of antimicrobial resistance has renewed scientific interest in medicinal plants as promising sources of novel antimicrobial agents (Angelini, 2024).
Blumea lacera (L.) DC., belonging to the family Asteraceae, is an annual aromatic herb widely distributed throughout tropical and subtropical regions of Asia. The plant has long been utilized in traditional systems of medicine, including Ayurveda, Siddha, and Unani, for the treatment of cough, bronchitis, dysentery, wound infections, fever, and gastrointestinal disorders (Sinha et al., 2024).
Phytochemical investigations have revealed the presence of several bioactive constituents in B. lacera, including terpenoids, flavonoids, sterols, triterpenes, cineole, fenchone, and various essential oils. These compounds are responsible for a wide range of biological activities, including antimicrobial, antioxidant, anti-inflammatory, anticancer, and wound-healing effects (Ashrafi et al., 2022; Sinha et al., 2024).

Recent studies have demonstrated that the essential oils and extracts of B. lacera possess significant antimicrobial activity against several pathogenic microorganisms. Chemical characterization of the leaf essential oil has identified numerous volatile constituents associated with antimicrobial efficacy, supporting its traditional medicinal applications (Tran et al., 2023).
Furthermore, contemporary pharmacological investigations have reported antioxidant, antibacterial, and anti-inflammatory activities of B. lacera, indicating its potential as a valuable source of natural therapeutic agents (Linh et al., 2024; Dubey et al., 2023).
The genus Blumea has recently attracted considerable scientific attention due to its rich phytochemical diversity. A comprehensive review published in 2026 reported more than 148 bioactive compounds from various Blumea species, many of which exhibit antimicrobial, anti-inflammatory, antioxidant, and hepatoprotective activities (Saikia et al., 2026).
Despite the documented pharmacological properties of B. lacera, information regarding its antifungal efficacy against economically important fungal pathogens remains limited. Fungal species such as Aspergillus flavus, Aspergillus niger, Alternaria spp., Penicillium spp., and Fusarium spp. are responsible for significant agricultural losses and food quality deterioration worldwide. Therefore, there is a growing need to identify effective, environmentally friendly, and economically viable plant-derived antifungal agents.
In view of the medicinal importance of B. lacera and the increasing demand for natural antifungal compounds, the present investigation was undertaken to evaluate the in vitro antifungal activity of different solvent extracts of B. lacera leaves against selected fungal pathogens. The study aims to provide scientific evidence supporting the traditional use of this medicinal plant and to explore its potential as a natural source of antifungal agents.

MATERIALS AND METHODS

Collection and Preparation of Plant Material

Leaf and root samples of Blumea lacera (L.) DC. were collected from various locations in Raipur, Chhattisgarh, India. The taxonomic identity of the plant was confirmed using standard floras and authenticated botanical references. The collected plant materials were thoroughly washed with tap water to remove dust and other contaminants and were subsequently shade-dried at room temperature. After complete drying, the samples were pulverized into a fine powder using a laboratory grinder. The powdered material was stored in sterile airtight containers to prevent moisture absorption and microbial contamination until further use (Harborne, 1998; Sinha et al., 2024).

Source and Maintenance of Fungal Cultures

The fungal species used in the present investigation included Aspergillus flavus, Aspergillus niger, Alternaria sp., Penicillium sp., and Fusarium sp. These fungi were isolated from soil samples and identified based on colony morphology and microscopic characteristics following standard mycological procedures (Watanabe, 2010; CLSI, 2022). Pure cultures were maintained on Potato Dextrose Agar (PDA; HiMedia Laboratories, India).
The PDA medium contained potato infusion (200 g L^{-1}), dextrose (20 g L^{-1}), and agar (15 g L^{-1}), with the pH adjusted to 5.6 ± 0.2 using 1 N NaOH or 1 N HCl. The culture medium was sterilized by autoclaving at 121°C and 15 psi pressure for 15 minutes (Aneja, 2018).

Preparation of Plant Extracts

Aqueous, methanolic, and acetone extracts of the powdered leaf and root samples were prepared to evaluate their antifungal activity. The extraction procedure was carried out using analytical-grade solvents according to standard phytochemical extraction methods (Azwanida, 2015). For methanolic and acetone extracts, 5 mL of each extract was evaporated to dryness in a water bath under a fume hood. The residue obtained was reconstituted with sterile distilled water to a final volume of 5 mL. The extracts were stored under refrigerated conditions until further analysis.

Evaluation of Antifungal Activity

The antifungal activity of the plant extracts was determined using the paper disc diffusion method, a widely accepted technique for preliminary screening of antimicrobial agents (Balouiri et al., 2016). Approximately

25 mL of sterile PDA medium inoculated with a standardized spore suspension of the test fungus was poured into sterile Petri dishes and allowed to solidify.
Sterile Whatman No. 1 filter paper discs (6 mm diameter) were impregnated with 0.5 mL of aqueous, methanolic, or acetone extracts. A 10 ppm solution of carbendazim served as the positive control fungicide. The impregnated discs were placed equidistantly on the surface of the inoculated PDA plates under aseptic conditions.
The plates were incubated at 28 ± 2°C for five days. Each treatment was performed in triplicate. Antifungal activity was assessed by measuring the diameter of the inhibition zone (mm) surrounding each disc. The mean inhibition zone was calculated and compared with that produced by the standard fungicide carbendazim (CLSI, 2022; Balouiri et al., 2016).

RESULTS AND DISCUSSION

The ethnobotanical survey revealed that Blumea lacera is an important medicinal plant widely used in traditional healthcare systems, particularly for the treatment of respiratory infections, wounds, and gastrointestinal disorders. Leaves are reported as the most commonly used plant part in folk medicine, reflecting their high therapeutic relevance. The continued traditional use of this plant supports its pharmacological potential, as also reported in recent ethnobotanical and phytopharmacological reviews (Sinha et al., 2024; Shirose et al., 2024).
Scientific evaluation of medicinal plants for antimicrobial properties remains an active area of research due to the increasing problem of drug-resistant pathogens. In the present study, the antifungal potential of B. lacera was evaluated against selected fungal pathogens. The results indicated that B. lacera possesses appreciable antifungal activity, particularly in aqueous extracts, supporting earlier findings on the antimicrobial potential of the genus Blumea (Saikia et al., 2026; Al-Snafi, 2023).

	Zone of Inhibition (m.m.)				
Organism Name► / Plant extract ▼	**Aspergillus flavus**	**Aspergillus niger**	**Alternaria sp**	**Penicillium sp.**	**Fusarium sp**
Aqueous	14	16	13	12	13
Methonol	--	--	--	--	--
Acetone	--	--	--	--	--
Carbendazim	20	19	18	19	18

Among the tested extracts, the aqueous extract showed inhibitory activity against all the fungal organisms used in the study. The highest zone of inhibition was recorded against Aspergillus niger, followed by Aspergillus flavus, Alternaria sp., Fusarium sp., and Penicillium sp. The observed antifungal effect may be attributed to the presence of water-soluble phytoconstituents such as phenolics, flavonoids, and glycosides, which have been reported to exhibit strong antifungal and membrane-disrupting properties (Shirose et al., 2024; Al-Snafi, 2023).
In contrast, methanolic and acetone extracts did not show any detectable antifungal activity under the experimental conditions. This may suggest that the active antifungal compounds in B. lacera are predominantly polar and more efficiently extracted in aqueous medium. Similar observations have been reported in recent studies where aqueous extracts of medicinal plants showed stronger antifungal effects compared to organic solvent extracts due to better solubility of active phytochemicals (Balouiri et al., 2016; Saikia et al., 2026).
When compared with the standard fungicide carbendazim, all fungal species showed higher sensitivity to the chemical fungicide. However, the aqueous extract demonstrated moderate but broad-spectrum antifungal activity, indicating its potential as a natural antifungal agent. The inhibition zones observed in the present

study are consistent with earlier reports on Blumea lacera, which highlight its antimicrobial and antifungal properties against a range of pathogens (Swaraz et al., 2022; Sinha et al., 2024).

Overall, the present findings confirm that Blumea lacera possesses significant antifungal potential, particularly in aqueous extracts. The results support its traditional medicinal use and align with recent literature emphasizing the antimicrobial and pharmacological importance of Blumea species (Saikia et al., 2026). Further studies involving isolation, characterization, and mechanistic evaluation of active compounds are required to validate its application as a natural antifungal agent in pharmaceutical and agricultural fields.

CONCLUSION

The present investigation confirms that Blumea lacera exhibits notable antifungal activity against selected fungal pathogens. The findings support its potential as a promising source of natural antifungal compounds, consistent with recent reports on the antimicrobial potential of Blumea species (Sinha et al., 2024; Saikia et al., 2026). In recent years, increasing attention has been given to plant-derived antifungal agents due to rising resistance in pathogenic fungi and limitations of synthetic fungicides (WHO, 2023; Al-Snafi, 2023).

It is also observed that comparatively fewer studies have focused on the antifungal activity of medicinal plants in contrast to antibacterial research, indicating a clear research gap in this area. The aqueous extract showed better activity in the present study, which aligns with recent findings that polar plant extracts often exhibit stronger antifungal effects due to the presence of phenolic and flavonoid compounds (Shirose et al., 2024).

Overall, the results of this study provide scientific validation for the traditional use of B. lacera and may contribute to future research aimed at developing plant-based antifungal formulations for pharmaceutical and agricultural applications.

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